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# PATENT SPECIFICATION

(11) 1 468 902

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- (21) Application No. 21026/74 (22) Filed 13 May 1974  
(31) Convention Application No. 7 318 616  
(32) Filed 17 May 1973 in  
(33) France (FR)  
(44) Complete Specification published 30 March 1977  
(51) INT CL<sup>2</sup> A01C 3/06; B65D 89/00; B65G 67/00  
(52) Index at acceptance  
A1D 1C2 1C3 1D8  
B8E 21B  
B8K 2K4 2L H



## (54) A MACHINE FOR THE HANDLING, CONVEYING AND DISTRIBUTING OF MATERIALS

- (71) We, ETABLISSEMENTS F. BUREL S.A. a French Company of Route de Rennes, 35220 Chateaubourg, France, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—
- The present invention concerns a machine for the handling, conveying and distribution of materials. The present invention is particularly but not exclusively in the field of agriculture, for the distribution of manure.
- It has been known for a long time to use for spreading manure a manure spreader constituted for example by a hopper and a throwing apparatus to distribute the manure on to the ground, the spreader being pulled or carried by a tractor which also provides the drive for the spreader. With this arrangement, the spreading is effected rapidly and only requires a single operator, namely the driver of the tractor. However, the use of these spreaders has not eliminated all the manual operations.
- At present, manure is generally delivered in bags of 50 kg. which are relatively easy to handle but which require also a considerable effort when it comes to emptying them into the hopper. This effort is increased when in order to give the spreader a greater range for the treatment of large areas, the hopper is extended upwards, raising the edges over which it is necessary to raise the sacks to be emptied.
- It has also been proposed to supply the manure in bulk and to mechanise the whole of the operation utilising for example as described in French Patent 2,082,421, a complex assembly comprising a tipping tub coupled to a tractor, the tub being capable of discharging its contents into a receptacle fixed to the rear part of the tub and provided with an elevating screw adapted to discharge the manure into the hopper of the actual spreader. This assembly is complicated and therefore expensive, and in particular is of great length which renders its utilisation practical only for large areas. In addition, the delivery in bulk presents in itself certain drawbacks. For example, where the manure is damp there is a tendency for lumps to form. The loading of the hopper is approximate because the estimation by weight of the manure discharged is difficult. There are losses in weight in the manure in the course of trans-shipment.
- One object of the present invention resides in providing a machine which obviates the above drawbacks and which presents a simple solution of the problem of handling, conveying to the ground and spreading manure, or, more generally speaking, different materials.
- It is known that there is a tendency to replace the handling of bags of small capacity by the handling in bulk in containers of large capacity. This tendency is shown in the handling and the transport of cement and materials used in building sites and public works.
- There is a tendency likewise to use containers of large capacity and at the same time to transport materials as far as the site and to distribute these materials on the site using the container as a silo.
- According to the present invention there is provided a machine for handling, transporting and distribution of materials contained in containers of the type adapted to be suspended at the top end and having an outlet at the bottom end from which the contents can be discharged, said machine comprising a material spreader and a movable chassis whereby the machine can be moved over the ground, means for lifting a container so that the container, when the lifting means is in a raised position, is placed

above the hopper of the spreader of the materials to be distributed, the said hopper being mounted on the chassis, and wherein, in the raised position, the bottom of the container is located above the hopper with the outlet in register therewith so that material discharged from said outlet passes directly into the hopper.

Preferably the said lifting means comprises an elongated rigid frame of which one end is articulated on the chassis the other end of which is provided with suspension means, the frame being adapted to be pivoted to lower the end having the suspension means to enable the said suspension means to be connected to or disconnected from a container, the machine further including mechanised means for pivoting the frame on the chassis.

Preferably the point of articulation of the frame on the chassis is situated so that the frame can be pivoted to a position wherein said point of articulation is at substantially the same level as the suspension means for connecting or disconnecting a container, in order that during the course of the lifting the initial movement of the container is lifted practically vertically.

Preferably the frame is provided with a wide fork adapted to limit lateral movement of a container when held by the frame in the raised position.

According to another preferred feature the mechanised means includes one or two hydraulic jacks for pivoting the frame between the raised and lowered positions, said jacks being adapted for connection to the hydraulic system of an agricultural tractor, the point of articulation of the frame being mounted on a support integral with the chassis so that in the lowered position, the suspension means overhangs the chassis by about substantially half the width of a container with which the machine is intended to be used.

According to another preferred feature, the said material spreader which is supported by the chassis, is pivotable on the chassis to facilitate the free movement of a container in the course of lifting or lowering of the lifting means.

Preferably the axis of pivoting of the spreader and the height of the hopper of the spreader are selected so that the spreader can be pivoted to a lowered position in which the edge of the hopper rests on the axle of a pair of wheels of the chassis.

According to yet another preferred feature, the machine has a front and a rear and is adapted to be drawn by a conventional agricultural tractor and the said chassis includes a coupling member at the front and two rear wheels, the spreader being adapted to be connected to the power take-off of the tractor by means of a gear

box and shafting including cardan joints.

Preferably also, the shafting connected to gear box comprises a first pair of cardan joint to take into account the relative movements of the tractor and the chassis and a second pair of cardan joints to permit pivoting of the spreader to the rear of the chassis.

The machine is preferably in combination with a container adapted to be suspended at the top and having an outlet at the bottom end from which the contents can be discharged.

Preferably, the container comprises flexible sack of large capacity having a flexible sleeve at the bottom defining the container outlet, said sleeve being capable of being folded against the bottom of the sack in the course of filling and transporting of the sack further comprising at its upper part a filling opening and a hook suspension arrangement.

Preferably also, the said hook arrangement comprises two straps parallel and integral with two opposite sides of the sack, each strap being looped and having a central cut-out part open towards the top.

The said hook arrangement may comprise additionally two bars of the approximate width of the straps, each bar having a central ring, and each bar being mounted in a strap with its ring projecting through the cut out part of the strap.

Preferably also the said hook arrangement comprises in addition a rocking lever comprising at its ends two hooks capable of being engaged into the rings of the bars, and in its middle a lifting hook capable of being connected to the suspension means, the lifting hook being capable of tilting in relation to the rocking lever.

According to yet another preferred feature, the said straps have a section sufficient to be engageable by the parallel arms of well known fork lift trucks.

Other features will appear more clearly on reading the description of one embodiment of the invention, the said description being given with reference to the attached drawings of which:—

Figure 1 shows in a side elevation a machine according to the invention, the machine being shown in the spreading position;

Figure 2 shows, a partially exploded side elevation of the machine of Figure 1 in the loading position, parts of the machine being broken away for illustration purposes;

Figure 3 shows, in rear elevation, the machine of Figure 1 in the spreading position;

Figure 4 shows an exploded view of the hooking means for the sack of Figure 1; and

Figure 5 shows a partial perspective view

of the spreader and of the sleeve of the sack of Figure 1.

In Figure 1, the machine of the invention is shown as provided with a chassis formed by beams such as 1, mounted on wheels, such as 2 and 3, by means of an axle 4. The beams 1 are straight or of any other shape and are connected at the front to a coupling ring 5 to permit the coupling of the machine to, for example, an agricultural tractor.

On the chassis, there is mounted a spreader of conventional construction comprising a hopper 6, a throwing disc 7 provided with throwing vanes 8, and a gear box 9, the whole being securely mounted on the chassis by a frame 10. Frame 10 is mounted on two pivot pins 11 located in the beams 1 and the frame 10 can pivot around the axis of the pivot pins 11 during driving of the assembly of the spreader. In Figure 1 and in Figure 2, it can be seen that the frame 10 comprises a lateral plate (the other diametrical lateral plate is not visible) connected at the top to the hopper 6, and at the bottom to the gear box 9 and has a wide cut-out part so as not to obstruct the throwing of the materials by the vanes 8 of the disc 7. The two lateral plates are intersected by cross braces (not shown). The plate of the frame 10 which is visible in Figures 1 and 2 is integral with a positioning bar 12.

The hopper 6 is of the conventional shape of a truncated cone and has adjustable openings in its base to allow an adjustable supply of material to pass towards the disc 7. The regulation of the openings is effected by means of a rod 13 articulated at 52. In a conventional manner, the openings are placed in respect of the disc 7, so that the throwing of the material is effected at an opening over an angle and at the rear of the machine. The gear box 9 defines a vertical axis about which the disc 7 rotates. There may be a crumpling finger at the base of the hopper. A driving axle 14 connects the power take-off of the tractor with gear box 9. In fact, the driving axis, containing shaft 14 has two conventional cardan joints, one comprising the cardans 15 and 16 connected by the telescopic shaft 17 to compensate for the relative movements of the tractor and the chassis of the machine, and the other comprising the cardans 18 and 19 connected by the telescopic shaft 20. In addition, the shaft 14 is carried by a bearing 21 integral with the chassis.

The lifting means of the machine comprises a frame 22 of shallow V shape constituted for example by two angle irons. The frame is pivotal about an axis 24 defined by supports 25 which are formed by triangular plates integral with the beams 1 and which support the frame 22. The movement of the frame 22 is effected by two hydraulic jacks

26 (only one shown). Each jack 26 is connected at its upper end to a clamp 28 so as to be pivotable about an axle 27. Clamp 28 is fixed to the frame 22. The lower end of each jack 26 is pivotally connected at an axle 29 carried by a triangular bracket 30 fixed to the beam 1. The jacks 26 are fed through the tubes 31 connected to the hydraulic pump of the tractor. The tubes 31 may be provided with stop valves permitting the blocking of fluid flow therethrough and locking in position of the jacks 26.

The frame 22 is provided at its upper end 23 with suspension means formed by a ring 32 and a shackle 33 from which any load may be suspended.

In the embodiment, this load is constituted by a sack 34 filled with manure. As Figures 1 to 4 show, the sack 34 is provided at the bottom with a sleeve 35 for discharging its contents, at the top with a sleeve 36, with two straps 37 and 38 seen in particular in detail in Figure 4. The sack 34 is for example made of cloth impregnated to render it impermeable. It has a substantially square section and a capacity of about 1500 kg. The straps 37 and 38 are connected at two opposite sides of an upper cover portion 39. Practically, the straps 37 and 38 may be extensions of two opposite walls of the sack. The straps have a height sufficient for the forks of a conventional lifting carriage to locate between the sleeves. They each have an open cut out part 40. The sleeve 35 is sufficiently long to be able to lead a cut about mid height into the hopper 6. The sleeve 35 is bound and folded under the sack when the latter is in the Figure 2 position. The sleeve 36 serves as a filler, and is unfolded similar to sleeve 35 for filling purposes and folded to the position shown in Figure 4 to prevent the entry of moisture into the sack when the sack is being emptied. It is obvious that the sack, once filled takes up a rounded shape. Placed on the ground it may have an overall width of 1.20 metres which permits the placing of two sacks in a lorry the platform of which generally has a width of about 2.50 m. Suspended, the sack stretches out as Figures 1 and 3 show. The height of the frame 22 is calculated according to the length of the sack to be suspended so that the sleeve 35 leads correctly into the hopper 6.

Figure 4 shows lift bars and the hooking means of the sack 34 in detail and these which are composed of two bars such as 41 and a catching lever 42. The bar 41 has the same length as a strap 37 or 38 into which it is introduced. It is provided with a ring which is accessible through the opening 40. The lever 42 has its ends provided with small hooks 44 adapted to be introduced into the rings 43 and comprises at its middle a hook 45 which preferably may pivot in lever 42

and which is hooked to the shackle 33. It is obvious that if a sack 34 of smaller capacity than the capacity indicated above of 1500 kg. is used, that is to say in principal a shorter sack, a chain may be provided between the hook 45 and the shackle 33.

Figure 5 shows the level of filling of the hopper 6 when the sack 34 is suspended as in Figures 1 and 3 that the binding of the sleeve 35 has been removed, the sleeve 36 being folded closed as in Figures 3 and 4. It has been found that with a granulated manure such as is now at present found in the trade, the hopper does not overflow even when the flow is facilitated by the movements of the bag in the course of the spreading. The sleeve 35 has a diameter of about 35 cm. and the hopper 6 a height of about 40 cm. The sleeve 35 extends to a position below the top level of the hopper.

Lateral and longitudinal movements of the sack 34 relative to the machine are limited by a wide fork comprising two arms 46 and 47 which clasp the sack and which are integrally connected to the frame 22 by means of a fastening plate 48. The ends of the arms 46 and 47 may be connected by a chain if necessary but experience has shown that if the distance between the arms is a little less than the transverse dimension of the sack, such a chain is unnecessary.

The axle 4 carries, directed towards the rear, a buffer connected by a vertical plate 49 mounted on a rod 50 integral with the axle 4. As will be seen in Figure 2, the plate 49 serves to define the position of the machine in relation to the sack 34 at the moment of lifting the latter.

The support 25 shown in Figure 1 and 2 carries a stud 51 serving to restrain the positioning bar 12 when the spreader is in the working position.

The various functions of the machine will now be described, commencing with the operation of lifting a sack 34. Driving the tractor, the operator backs the machine towards the sack until the buffer 49 touches the wall of the sack as indicated in Figure 2. He then operates the hydraulic system in such a manner that the jacks 26 are retracted, lowering the frame 22 until the end 23 of frame 22 lines above the centre of the sack. Coming down from the tractor, the operator unhooks the bar 12 from the stud 51 to pivot or tip the spreader to the rear until the edge of the hopper 6 rests on the axle 4. With the inclination of the spreader, the frame 10 turns around the axle 11, the rod 13 turns around the articulation 52 and the shaft 20 connecting the cardan transmission 18—19 extends because it is telescopic. This inclination of the spreader permits limiting of the length of the frame 22. In fact in the contrary case, it is easy to see, considering Figure 1 that for the

bottom of the sack 34 to pass above the edge of the hopper 6 it would be necessary to provide a longer lever arm which could make the machine unstable when the frame 22 lifts a full sack and could require the provision of a much longer sleeve 35, and the sack would require to be suspended from much higher. Considering Figure 2, it appears that the length of the frame 22 no longer depends on the height of the hopper under the same conditions, the sack having in any case to pass above the axle 4.

The operator next passes the bars 41 into the straps 37 and 38, hooks on the lever 42 so as to engage the hooks 44 in the rings 43 emerging from the openings 40, and hooks the hook 45 on the shackle 33.

Returned to his tractor, the operator operates the hydraulic system which extends the jacks 26 to the Figure 1 position. He may then operate the valves which lock the jacks in this position. The sack 34 is suspended in the position of Figure 1 and is engaged only between the arms 46 and 47 which hold it. Coming down again from the tractor, the operator again raises the spreader and positions the bar 12 under the stud 51. The lifting operation is then terminated.

The machine is drawn as far as the ground to be spread. The operator releases the sleeve 35 which takes the position indicated in Figure 5. Then the operation of spreading is effected as with a conventional spreader, the opening of the hopper 6 being regulated normally by means of the control rod 13. Once the sack is emptied, the machine is taken back to the place of charging where the operator lowers the frame 22 as has been described previously, unhooks the rocker lever 42 and withdraws the bars 41 from the straps 37 and 38 of the empty sack. It is to be noted that the unhooking may be effected directly above a new sack to be hooked on.

It is now easy to ascertain all the advantages brought about by the machine of the invention, by summarising briefly the operations preceding the spreading. The manure may be supplied in bulk from a wholesaler who effects the bagging by mechanised means directly in the sacks such as 34. The sacks are easily transportable and loadable on the lorries by means of a conventional fork lifter or crane now conventional, mounted permanently on the lorry. The sacks are deposited on the land when delivered by means of the lorry crane. The remainder of the operations is according to the above description. Thus, and this is important, between the delivery in bulk form, the wholesaler and the spreading, all the operations can be mechanised and do not required any physical effort by the personnel apart from the driving of the vehicles and the operation of levers.

This is not the only advantage over the

delivery in sacks of 50 kg. In fact, with the latter the cost of the bagging is considerable whilst the sacks used in the invention, the operation of bagging is more simple and the sacks may be recovered to serve several times. The manure in bulk in a tub cannot be used completely because the tubs are generally rectangular and it is difficult to recover the manure remaining in the corners. With the sacks as described there is no loss. Finally, a load of 1500 kg. does not create a pressure on the ground which is too considerable even on light soils. On the contrary, tubs loaded with several tons of manure tend to ram the soil under the wheels of the tub.

It is also to be noted that the machine of the invention may serve to convey other containers or heavy parts.

As has already been mentioned above, the sacks may have variable capacities and the capacity of 1500 kg. has only been indicated by way of example. Further, although one embodiment particularly adapted to the spreading of the manure has been described, it must be understood that the machine may serve for the handling, transporting and distributing of other materials such as any granulated or pulverant material.

Although the invention has been described above, in relation to one particular embodiment, it must be understood that the said description has only been given by way of example and does not limit scope of the invention, which is defined by the appendant claims.

#### WHAT WE CLAIM IS:—

1. A machine for handling, transporting and distribution of materials contained in containers of the type adapted to be suspended at the top end and having an outlet at the bottom end from which the contents can be discharged, said machine comprising a material spreader and a movable chassis whereby the machine can be moved over the ground, means for lifting a container so that the container, when the lifting means is in a raised position, is placed above the hopper of the spreader of the materials to be distributed, the said hopper being mounted on the chassis, and wherein the raised positioned, the bottom of the container is located above the hopper with the outlet in register therewith so that material discharged from said outlet passes directly into the hopper.

2. A machine according to Claim 1, wherein the said lifting means comprises an elongated rigid frame of which one end is articulated on the chassis the other end of which is provided with suspension means, the frame being adapted to be pivoted to lower the end having the suspension means to enable the said suspension means to be

connected to or disconnected from a container, the machine further including mechanised means for pivoting the frame on the chassis.

3. A machine according to Claim 2, wherein the point of articulation of the frame on the chassis is situated so that the frame can be pivoted to a position wherein said point of articulation is at substantially the same level as the suspension means for connecting or disconnecting a container, in order that during the course of the lifting the initial movement of the container is lifted practically vertically.

4. A machine according to Claim 2 or 3, wherein the frame is provided with a wide a fork adapted to limit lateral movement of a container when held by the frame in the raised position.

5. A machine according to Claim 2, 3, or 4, wherein the mechanised means includes one or two hydraulic jacks for pivoting the frame between the raised and lowered positions, said jacks being adapted for connection to the hydraulic system of an agricultural tractor, the point of articulation of the frame being mounted on a support integral with the chassis so that in the lowered position, the suspension means overhangs the chassis by about substantially half the width of a container with which the machine is intended to be used.

6. A machine according to any preceding Claim wherein the said material spreader which is supported by the chassis, is pivotable on the chassis to facilitate the free movement of a container in the course of lifting or lowering of the lifting means.

7. A machine according to Claim 6 wherein the axis of pivoting of the spreader and the height of the hopper of the spreader are selected so that the spreader can be pivoted to a lowered position in which the edge of the hopper rests on the axle of a pair of wheels of the chassis.

8. A machine according to any one of the preceding Claims, wherein the machine has a front and a rear and is adapted to be drawn by a conventional agricultural tractor and the said chassis includes a coupling member at the front and two rear wheels, the spreader being adapted to be connected to the power take-off of the tractor by means of a gear box and shafting including cardan joints.

9. A machine according to Claim 8 when dependant upon claim 6, wherein the shafting connected to gear box comprises a first pair of cardan joints to take into account the relative movements of the tractor and the chassis and a second pair of cardan joints pivoting of the spreader to the rear of the chassis.

10. A machine according to any preceding Claim, in combination with a container

which is adapted to be suspended at the top end and having an outlet at the bottom end from which the contents can be discharged.

5 11. A machine according to Claim 10, wherein the container comprises flexible sack of large capacity having a flexible sleeve at the bottom defining the container outlet, said sleeve being capable of being folded against the bottom of the sack in the course of filling and transporting of the sack, the sack further comprising at its upper part a filling opening and a hook suspension arrangement.

15 12. A machine according to Claim 11, wherein the said hook arrangement comprises two straps parallel and integral with two opposite sides of the sack, each strap being looped and having central cut-out part open towards the top.

20 13. A machine according to Claim 12, wherein the said hook arrangement comprises additionally two bars of the approximate width of the straps, each bar having a central ring, and each bar being mounted in a strap with its ring projecting through the cut out part of the strap.

25 14. A machine according to Claim 13,

wherein the said hook arrangement comprises in addition a rocking lever comprising at its ends two hooks capable of being engaged into the rings of the bars, and in its middle a lifting hook capable of being connected to the suspension means, the lifting hook being capable of tilting in relation to the rocking lever. 30 35

15. A machine according to any of the Claims 12 to 13, wherein the said straps have a section sufficient to be engageable by the parallel arms of well known fork lift trucks.

16. A machine for handling, transporting and distributing materials, substantially as hereinbefore described with reference to the accompanying drawings. 40

17. A machine according to any of Claims 10 to 15, wherein the container is substantially as hereinbefore described with reference to the accompanying drawings. 45

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COMPLETE SPECIFICATION

3 SHEETS

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Sheet 1

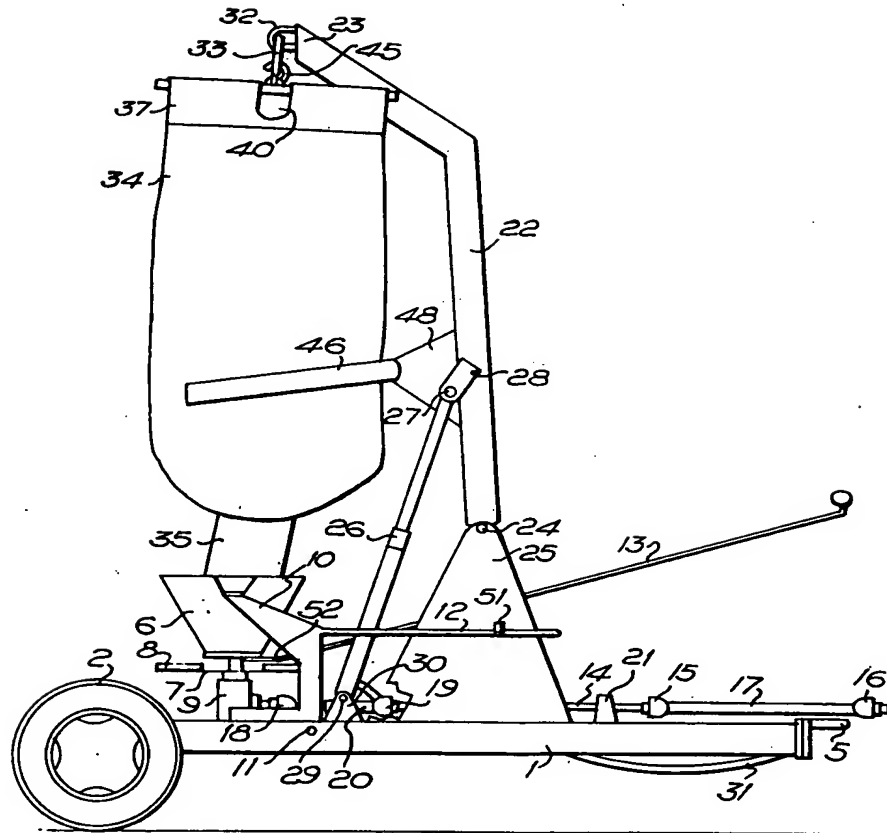


FIG. 1





## COMPLETE SPECIFICATION

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**Sheet 2**



FIG. 2

